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PROMISING NEW OUTLETS FOR FARM PRODUCTS

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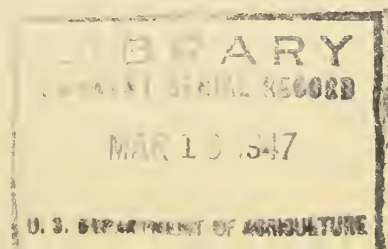
By Louis B. Howard, Chief
Bureau of Agricultural and Industrial Chemistry
Agricultural Research Administration
United States Department of Agriculture

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It is a pleasure to talk with you today about one of the approaches in extending the markets for farm products in which the Bureau of Agricultural and Industrial Chemistry is actively engaged. The four Regional Research Laboratories, which were established by the Department of Agriculture primarily to search for new and wider outlets and markets for agricultural commodities in the industrial and food fields, have already made notable accomplishments.

Most of you here today are familiar with these large research centers, but for the benefit of those who are not a few words about the situation which led to their establishment are in order. The Department of Agriculture had been searching for industrial outlets for farm products in a limited way for 25 or 30 years before the establishment of these research laboratories, but it was a sort of a side line compared with the main agricultural program. The Chemurgic movement which originated in the late twenties advocated the industrial utilization of farm crops. Some of the State Agricultural Colleges were interested in that field as were other public and private agencies. Certain outstanding individuals were strong advocates of the industrial utilization idea. But interest was more or less sectional or spotted until the heavy surpluses of farm crops began to beat down prices in the early thirties. This condition untied the various chemurgic movements for the industrial utilization of farm crops. The combined movement grew and spread until 1938 when Congress authorized the Secretary of Agriculture to establish these large research centers. This marked the beginning of the Federal Government's entry into the industrial utilization field on a large scale. The establishment of these laboratories made it possible to attack this problem on a nation-wide basis. One laboratory was established in each of the four major farm producing areas of the country. They were located at Peoria, Ill., for the North Central States; at New Orleans, for the South; at Philadelphia, for the East; and at Albany, in the San Francisco Bay area, for the West. They are operated by the Bureau of Agricultural and Industrial Chemistry of the Agricultural Research Administration.

It cost about 2 million dollars each to build and equip these laboratories and each receives an appropriation of one million dollars a year to carry on the research. Approximately 1,000 persons are employed in these four research centers; more than half of them are chemists, physicists, and other highly trained scientists. It took about 2 years to build and equip these centers which were occupied in 1941.



Research is now under way on the following commodities:

Northern Laboratory

Corn, wheat and
other cereal crops
Soybeans and other
oilseed crops
Agricultural residues, such
as straws and stalks

Southern Laboratory

Cotton
Sweetpotatoes
Peanuts

Eastern Laboratory

Tobacco
Apples
White potatoes
Milk products
Vegetables
Animal fats and oils
Tanning materials,
hides, and skins

Western Laboratory

Fruits
Vegetables
White potatoes
Wheat
Alfalfa
Poultry products
and byproducts

Fortunately these laboratories were completed and staffed in time to aid in wartime research. More than 150 research projects dealing with the use of agricultural commodities in the war were carried on in these centers during the war years. Scientists in the Northern Laboratory quickly increased the yield of penicillin so it could be produced on a commercial scale. They did this by feeding the mold that produces penicillin a new diet composed largely of two agricultural products--corn steeping liquor, a byproduct from the manufacture of corn starch, and lactose or milk sugar. About 6 million pounds of milk sugar and 12 million pounds of corn steeping liquor, valued at \$1,560,000 and \$234,000, respectively, are used annually in the production of penicillin. The value of penicillin produced in 1945 is estimated at more than 100 million dollars, but no money value can be placed on the human lives saved as a result of the large-scale commercial production made possible by the laboratory scientists shortly after our entry into the war.

Wartime research in the Southern Laboratory showed that better tire cord can be made from cotton by using varieties of cotton selected specifically for this purpose on the basis of their physical properties. Passenger-car tires in the popular 6.00-16 size, made from standard and improved cotton cord, ran over 68,000 miles, with one recapping, at a sustained highway speed of 60 miles an hour which as you know cuts the rubber off a tire pretty fast. These tests were made by the Army Ordnance Department at its proving grounds at San Antonio, Tex. In the 7.00-20 light truck-tire tests, in rear-wheel positions, tires made from a selected variety of cotton, gave 300 percent more mileage than tires made from regular commercial cotton cord. These tests showed that cotton is adequate for passenger-car tires, and that we can definitely increase the mileage of light truck tires by making them from selected varieties of cotton. In other words, this research shows that the time has come for us to begin to give more thought to the

selection of varieties of cotton and other crops that possess the characteristics needed for the things we want to make. That is particularly true of crops grown for industrial purposes.

Chemists in the Eastern Laboratory appear to be on the verge of making a hero out of the lowly buckwheat plant. It is being used to produce a drug called rutin, which is extracted from the leaves and blossoms of the green plant. Rutin gives promise of being beneficial in treating persons who are suffering from high blood pressure associated with increased capillary fragility. The results of clinical tests thus far indicate that rutin is beneficial in strengthening the weak capillaries. During the last 30 months more than 1,200 cases have been studied by research men at the University of Pennsylvania Medical School and its affiliated hospital. About 20 percent of the patients treated with rutin were suffering from fragile capillaries. Of these, 88 percent were restored to normal through the use of rutin.

Rutin is a tasteless, bright-yellow powder that can be made up and taken in tablet form. It is non-poisonous and keeps well under normal conditions. The job of the laboratory scientists is to work out practical and economical methods for extracting the drug on a commercial scale. The clinical work is done by medical people. During the summer of 1945 about 300 pounds of rutin were extracted from green buckwheat plants by four large drug manufacturers under the technical guidance of chemical engineers from the Philadelphia Laboratory. The quantity will be much larger this year. As the plant is cut green instead of being allowed to mature, it is possible to get two and in some instances three crops of buckwheat in one season when it is used for rutin. By a rough estimate, it will require about 10,000 pounds of rutin to meet the experimental demand for the drug this year, and more than a million pounds a year to meet medicinal requirements should the present promising results be substantiated and the drug be placed on the open market. This would mean that about 50,000 acres of buckwheat would be needed each year for the production of this drug.

The Western Laboratory scientists are trying to find a market for chicken feathers. Feathers—like wool, hair, hoofs, and horns—are composed largely of a fibrous protein called keratin. It is estimated that around 175 million pounds of chicken feathers are wasted each year. Fundamental research looking toward the industrial utilization of at least a part of this material has been going on in the Western Laboratory for a number of years. This research has led to the production, on a pilot-plant scale, of keratin or chicken-feather fiber. The wet strength of this new fiber is still too low for practical purposes, but the chemists are working on that phase of the problem and hope to solve it eventually. Wet strength has always been a problem in the production of synthetic fibers. Those who wore wartime rayon hose will remember how they were told to dry them for 24 or more hours after washing so they would be thoroughly dry when used.

Laboratory scientists are at work on another synthetic fiber. It is

an artificial textile fiber that appears to be suitable for blending with rayon, cotton, and wool for knitting yarns and woven fabrics. It is called "zein," and the finished fiber has a rich creamy appearance. Its dry strength is equal to that of wool, but the wet strength is only about half of the dry strength, so there is need for more research on that phase of the problem. The fibers are not damaged by washing with soap solutions. This is a protein fiber made from the gluten of corn. It is believed that the spinning and finishing of zein fibers can be made continuous which will be a decided advantage over the batch method of production. One commercial company is getting ready to start research on a pilot-plant scale on the production of this new fiber, and the textile industry generally appears to be interested in the product.

Research in one of the laboratories has resulted in the production on an experimental scale of a peanut-protein fiber. The name that has been given to this new fiber is "Sarelon." It has a light cream color, and a soft pleasant feel, about midway between that of silk and wool. It takes dyes similar to those used on silk and wool, and shrinks very little in hot water. In its heat-insulating and moisture-absorbing properties it resembles wool. It may be used alone or mixed with cotton or wool fibers. Its major weakness, as in other synthetic fibers, is its low wet strength. Efforts are being made to improve this property, but it may require considerable research to do it.

Under normal conditions this country uses a large quantity of paint brushes and brushes of various kinds. Before the war, imported hog bristles were used extensively in the manufacture of some of these brushes. Imported bristle from China has been better than our domestic-produced bristle, because we slaughter our hogs at an earlier age than they do in China. One of the laboratories has developed a continuous process for the production of casein fiber for making brushes which appears to be satisfactory. One commercial firm has decided to manufacture casein bristle according to the continuous method developed in the laboratory. It has constructed a factory building for this purpose and plans to start trial runs as soon as the necessary equipment can be installed.

It should be borne in mind, of course, that these synthetic fibers, now being produced on an experimental scale in the Bureau's four Regional Research Laboratories, are being developed not to replace cotton, wool, or other natural fibers, but in the hope of strengthening the natural fibers. The scientists hope to improve textile materials by combining the special properties of the new synthetics with the proven qualities of the natural fibers.

At the beginning of the war the Navy was using hominy grits for cleaning carbon from the engines of its aircraft. Hominy is a food, so we were asked to search for a non-food material that might be used for this purpose. One of the laboratories solved the problem by developing a soft-grit blasting material made from corncobs and rice hulls, both largely waste products of the farm. The mixture is composed of 60 percent ground corncobs and

40 percent whole rice hulls and is used in regular air-blasting equipment.

This new method has several advantages over the methods of cleaning that have been in use for a long time. It removes carbon, oil, and other deposits and gives the metal a clean dry surface without grinding away or reducing the size of the cleaned parts, and it is about 10 times faster than the work can be done by hand. As a result of this research, first on a laboratory and then on a pilot-plant scale, the soft-grit blasting method is now going into commercial use. One large company that rebuilds automobiles has adopted this method for cleaning pistons, fuel and water pumps, and carburetors. Another company is cleaning its aluminum foundry cores by the soft-grit method while a glass company is using the method to clean its glass molds. A large oil company is using the method for cleaning paint from the roofs of its huge gasoline storage tanks, because the soft-grit material does not produce sparks.

Down in the Florida Everglades a large sugar corporation has started large-scale production of sweetpotato starch in its new 7-million-dollar plant which is the largest of its kind in the world. This plant was built on the faith the company officials had in the work on sweetpotato starch the Bureau of Agricultural and Industrial Chemistry has carried on over a period of more than 10 years. Scientists in the Southern Laboratory, where the sweetpotato utilization work is being done, supplied a great deal of the technical information needed in the construction and initial operation of this new plant, which consumes the annual crop from around 12,000 acres of sweetpotatoes. A bushel of these potatoes produces from 10 to 13 pounds of starch and about 5 pounds of cattle feed. The cattle feed contains from 85 to 90 percent of the feeding value of corn, and is fed along with other mixtures to the more than 2,000 head of cattle being continuously fattened on the company's holdings.

Another project is the research on the production of synthetic liquid motor fuel from agricultural residues or so-called farm-waste materials. The process calls for the chemical conversion of corncobs, sugarcane bagasse, peanut shells, flax shives, and cottonseed hulls into liquid motor fuels and other commercially valuable products. Results of the research thus far indicate that from 90 to 95 gallons of liquid motor fuel can be obtained from a ton of corncobs or cottonseed hulls, and that about half of this is in the form of ethyl alcohol. A two-story factory-type building to house this new work has been constructed on the grounds of the Northern Laboratory, and the equipment is being installed. The plant, which will be in production by the end of this year, will consume around 6,500 pounds of raw residue material in each 8-hour operating period. It is estimated that probably half of the 200 million tons of farm waste produced in the United States each year might be available for use in producing motor fuel. Corncobs will be the first waste material to be tried in the new semicommercial plant.

Although the laboratories were established to search primarily for industrial outlets for agricultural commodities, their investigations are not confined to that field. They work on any program that gives promise of

expanding or increasing the outlets for farm products. This calls for a certain amount of research in the food field, and the California Laboratory has made some very worth-while contributions to that part of the utilization program.

Velva Fruit, an ice-cream-like product that can be made from fully ripened fruit, much of which is often lost because it is frequently too soft for shipment to fresh fruit markets, is an example of a new outlet in the food field. Several hundred thousand gallons of this delicious whole-fruit dessert were made and sold on the commercial market in 1945 as a result of research by the laboratory scientists.

The Western Laboratory has developed new food products in which modified pectin is used like gelatin or starch in powdered mixtures for preparing a jelly-like dessert. These new products can be made without cooking or the use of hot water. A modified pectin was used for preparing a fruit spread from uncooked fruit juice or puree that is preserved by freezing. The scientists developed a ready-to-use low-sugar jellied fruit salad or dessert that is sterilized by heat and preserved in tin cans. More than 20 million cans of this product was packed commercially for use in Army field rations during the war.

These are a few of the accomplishments that have resulted from research in these laboratories since their establishment a few years ago. Not all the achievements have been mentioned—just enough to show that the laboratories have been successful in using chemistry as a tool to find new and wider outlets and markets for agricultural commodities. One of the reasons for their success is the fact that one-third of the space in each of the laboratories is devoted to what is known as pilot-plant research. That is research that carries promising results on beyond the test-tube stage into what is sometimes termed semicommercial production, where cost figures and data can be obtained on a broader scale.

The need for the type of research that is being done in these four laboratories is perhaps greater today than ever before because farmers are facing the tremendous problem of adjusting expanded wartime production to peacetime needs. This is particularly true in sections where a large acreage has been devoted to the production of war crops. New outlets, or even a slight expansion of present outlets for some of these commodities, might aid materially in the conversion program.

There is a growing interest in the production of crops for industrial purposes, and the outlook is more promising in that field now than it was when the laboratories were built. But changes in cropping systems or in methods of production take place rather slowly, and it will probably be a number of years before the growing of crops for industrial use will be in general practice. It will probably develop slowly over a period of years as the industrial markets are established, and as farmers become acquainted with the production of commodities for that use.